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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## A METHOD AND AN APPARATUS FOR IDENTIFICATION AND CONTROL OF HANDLING OF KEYS AND THE LIKE

5 The present invention relates to a method for identification and control of the handling of keys and the like according to the preamble of claim 1. The invention also relates to an apparatus for carrying out the method set forth in claim 1 according to the preamble of the first apparatus claim.

10 In e.g. offices, factories, hospitals, hotels, security companies, car repair shops and car rental services, mail-carrying companies, shipping agencies, banks, apartment buildings, real estate companies etc usually a relatively large number of keys for various properties, apartments, rooms, file cabinets, safe-deposit boxes, cars etc are circulated. The keys are used by a fairly large group of people and so far it has been difficult or impossible to e.g. keep track of the whereabouts of certain keys/persons at certain points of time. Mistakes and neglects can easily occur, when the key cabinet is used and also when keys are manually handed out and this is registered. Also, all personal handling is  
15 very time consuming and expensive.

In order to avoid to a large extent the last-mentioned drawbacks electronic circuitries including IC-circuits have already been used, which can identify certain used codes, which are associated with a loose object. However, partly the design of these electronic circuitries is imperfect and limited and  
20 partly their applications are defective and impractical, and consequently e.g. the security cannot be guaranteed and a reliable survey of the situation is lacking.

US-A-4 549 170 relates to a system for handling a key panel. The panel is designed for a very large number of, namely one thousand, keys, which mutually can and presumably should vary rather  
25 strongly (see Figs 1 and 2). Each key with its special design will be used in a particular corresponding special opening having a fitting module in said panel (see column 3, lines 9-15).

This may cause a difficult searching, in case corresponding numberings are not available. The keys are completely conventional but designed to, when they have been inserted into the panel, trigger an  
30 electric contact via their handle or tip or point. A wrong key can of course be inserted into a panel opening, but only if the shape of the opening in depth allows this. The triggered contact is forwarded to an electronic system for various indications. However, the keys are per se not designed to forward any special information from the user or in a reliable way from themselves for the above-mentioned reason. The system must in all likelihood on every occasion be composed in a special  
35 way, and quite likely often be recomposed, since locks and keys often are exchanged for other locks

and keys. This makes the system not very suitable for a practical usefulness and at least makes it most detailed, inflexible and expensive in manufacturing and maintenance situations.

5 The object of the present invention is to provide a method of counteracting and to the utmost possible extent eliminate these drawbacks as well as to in various additional respects enhance the state of the art in this field.

10 These objects are attained according to the present invention by carrying out a method of the kind mentioned in the introduction mainly as set forth in the characterizing clause of claim 1. Said objects are also attained by designing an apparatus of the kind mentioned in the introduction mainly in the way set forth in the characterizing clause of the first apparatus claim. Thanks to the invention a robust but still highly sophisticated and completely reliable method of handling , with the greatest imaginary carefulness and reliability , an arbitrary number of keys has been developed. By means of their pin-like shape the identification and control devices protect their sensitive contents to a great  
15 extent. Thus, they can be subjected to a rough treatment for an extended time without this having a damaging effect on their functioning. The pin-shape is flexible in all respects and not bulky nor heavy. At the same time the pin-shape allows to a large extent a protection of the sensitive parts of a local control unit, since these parts are mounted in a careful way within said unit and are concealed and protected. Despite the fact, that thousands or many thousands of different codes can be stored in  
20 the pins, they are uniform and thus, they do not cause any problems, when keys, users, storage spaces etc. are exchanged.

Additional characterizing features and advantages of the invention are set forth in the following description, reference being made to the enclosed drawings, which show a few preferred but not  
25 limiting embodiments. The drawings show in detail in:

Fig. 1 an apparatus according to the invention with a perspective view from one end, from above and from the front , of a control and indication unit;

Fig. 2 a perspective view of the outer end of an identification and control device, which is a part of  
30 the apparatus according to Fig. 1;

Fig. 3 a diametrical longitudinal section through the device according to Fig.2;

Fig. 4 the unit according to Fig. 1 in an end view from the left in Fig. 1;

Fig. 5 a diametrical cross-section of the unit according to Fig. 1; and

Fig. 6 a view of a modified apparatus, which is similar to the apparatus shown in Fig. 4.

An apparatus 1 according to the invention is shown in its entirety. It comprises three main components, namely at least one control and indication unit 2, a plurality of identification and control devices 3, designed for unit 2 as well as a control center 4. Said unit is shown in the drawings as a strip for 14 pin-shaped identification and control devices. The shown strip shape is only one example, which can be replaced by any other suitable shape, e.g. the rear or interior side of a key cabinet. The pin shape of said device is also only an example, which can be replaced by any other suitable shape. The number of units and devices can vary within certain limits. Also, more than one center can be used.

10 Strip 2 comprises a frame work with a U-shaped cross-section made of metal sheet, the free longitudinal edges of legs 11,13 of which end in away from each other directed narrow flanges 6 having a few further outstanding eye fastening means 7, designed to receive screws (not shown) for the fastening of the strip to a wall.

15 A fastening profile 8 is inserted into the U-profile and has the same longitudinal extension. The fastening profile, which is substantially L-shaped, has a base leg 9, which lies in the same plane as flanges 6, a bearing leg 10, short in profile, being connected to the free longitudinal edge of base leg 9 and designed to bear on the interior side of first leg 11 and the frame work. Second leg 12 of fastening profile 8 runs parallel to second leg 13 of the frame work at a distance inside the same.

20 Bolts 15 extend through front side 14 of frame work 5 and base leg 9, spacing sleeves 16 connecting theses two parts to each other to obtain a manageable unit.

Leg 12 of fastening profile 8 carries via fastening means 17 a printed circuit card 18 on its side, which faces leg 11 and the frame work, from which circuit card a contact means 19 projects towards said leg of the frame work, designed as a ribbon, which is parallel to front 14 of the frame work and comprises electric cables, separated from each other (not shown), one cable for each identification and control device. For the rest the electric circuit suitably is closed to printed circuit card 18 via frame work 5, which that portion of device 3 contacts, which is electrically isolated from another portion of device 3, which can be electrically contacted with contact means 19. Printed circuit card 18 is via a signaling circuit 46 connected to a center 4 and a local PC, a display unit or the like respectively, which in its turn is connected to center 4.

35 Base leg 9 of the fastening profile carries via fastening means 20 by means of its side, which faces the front of the frame work, a fastener 21 for permanent magnets 22, which project towards the front of the frame work, one for each identification and control device.

- The front of the frame work has a number of holes 23, which correspond to said number of identification and control devices 3, suitably having inwardly bent collars 24, designed to provide a guide effect. Also, the front of the frame work is provided with diode lamps 25, connected to printed circuit card 18, fitted into said holes and designed to indicate e.g. an authorization and a non-authorization respectively, when an identification and control device 3 has been fully inserted. Non-authorization or non-availability can be indicated by a red light, whereas authorization or availability can be shown by a green light. Many different possibilities and combinations are of course possible, which hardly need any description in more detail.
- 10 In a preferred embodiment an identification and control device 3 according to the invention comprises a pin-like shell 26, e.g. made of a light metal. One end 27, the exterior one, of shell 26 can be pointed like a wedge and provided with a hole 28 right through it, for receiving a key-ring 29, to which a key (not shown) is to be fastened.
- 15 Sheet 26 comprises two parts, one front (inner part) 30 and one rear (outer) part 31. End sides 32, 33, facing each other, of the two parts formed in this way, are each provided with a cylindrical recess 34 and 35 respectively for receiving a carrier 36 made of an electrically isolating material, e.g. a plastic material. The carrier substantially has a cylindrical shape and fits with press fit with each end into a respective recess, a cavity 37 and 38 respectively remaining, designed to receive e.g.
- 20 screw-shaped electrically conductive compression springs 39, 40. Around the central part of the shell a flange 41 extends, which separates the ends of said parts 30, 31 from each other and consequently is electrically isolating, whereas the axially hollow shell receives a printed circuit card 42 and a chip 43, which is loaded with a unique code for each identification and control device. A compression spring with its one end abuts each end of said printed circuit card 42, whereas the other
- 25 end of the compression springs is supported by the respective bottom of said recesses 34, 35. Finally the end of each device 3, which is the front end in the insertion direction, receives in a recess 44 a steel washer 45, designed to cooperate with one of said permanent magnets via said ribbon 19 and an electric cable in it.
- 30 Such an apparatus according to the invention will function in the following fashion: In a typical case a control and indication unit (the strip) 2 is mounted in a key cabinet (not shown), locked by means of a code lock, in which a user inserts his code in order to open the cabinet. When the code is inserted, a signal transfer to printed circuit card 18 in addition to a release of the key cabinet door takes place, for each insertion place 23 for an identification and control device (the pin) 3, an
- 35 authorization and/or a non-authorization being indicated, e.g. by means of a green illumination of a diode lamp 25 for an authorization, whereas for a non-authorization a red illumination of the diode

lamp is used. When one or several keys are removed in a proper way, a signal is transferred via printed circuit card 18 of the strip to said control center 4 having a central printed circuit card, in which the removal is registered and stored. When a removal takes place in an improper way, an alarm signal is transferred in a similar way to said center and forwarded to e.g. an alarm device.

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Up to the return of the key/the keys it/they and/or the attached pin(s), when e.g. a door is unlocked, can send a signal, which is registered in said center and/or another center.

When the key/the keys are returned, the respective diodes emit light, when the user has inserted his code, and indicate, where the key/the keys is (are) to be inserted, which also is registered in said center.

Via any of said centers, possibly via a connected PC, the user will in each phase be able to see, who has removed which keys and possibly also the point of time of removal, unlocking, locking, return etc. Also, security functions can be integrated, e.g. the return of keys before a certain point of time.

The apparatus shown in Fig. 6 differs from the apparatus shown in Fig. 4 and 5 respectively solely regarding the signal transfer. Permanent magnet 22' is in this case, by means of fastening means 20' and a fastener 21', e.g. a bolt and a nut, fastened to printed circuit card 18, device 3 with its insertion end directly abutting the magnet and the information being transferred from device 3 to circuit card 18. In this case magnet 22' has a double function, namely partly, like before, to secure the correct insertion position of the device by attracting the same, and partly to take over the function as electric contact means of means 19. Device 3 suitably comprises two metal parts, e.g. a front part made of steel and a rear part made of a lighter metal. Via hole 23 and control collar 24 respectively, in which the material jointly with the rest of the shell also is made of an electric conductive material, e.g. metal, the rear end of device 3 is grounded. As an alternative to this grounding it is possible to let some type of spring radially abut the rear portion of device 3. Collar 24 can, particularly in the latter case, be made of a plastic material. Device 3 can also entirely or partially be made of a plastic material, e.g. a plastic material having conductive portions.

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The apparatus according to the invention suitably is provided with a special computer program, which also comprises the possibility of successively adding one or more additional strips or the like to a suitable number of insertion positions. The apparatus, the method and also said computer program allow a mounting of devices 3 in "stationary" or changeable positions. In the latter case device 3 can be inserted into an arbitrary hole 23. Thanks to printed circuit card 42 of device 3 and chip 43 it is easy for control center 4 to recognize each device 3 as a unique part and to indicate its

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possibly changed position. In case a programming has been done for "stationary" positions and device 3 still is mounted in a position other than the indicated position, the local and/or the central electronic circuitry can indicate the changed position by means of a short buzzer signal. In case still no repositioning of device 3 takes place, its actual position will be registered and it will be indicated  
5 at the next inquiry opportunity, i.a. by means of diode lamp 25. In case the user takes the wrong device 3/key, i.e. a device, for which the code and the ID of the user is not programmed, the device will issue an alarm signal, preferably initially a "small" alarm signal during a few seconds, in order to allow the user to understand his mistake and reposition device 3, and after e.g. 10 seconds a "big" alarm signal. According to a preferred embodiment a locked cabinet (not shown) is provided with a  
10 code lock and a display (not shown). After writing the correct code the cabinet can be opened. The user can now choose the desired key (one at a time). The keys are, when registered, provided with a name and/or a number. After the writing of a key name and a number respectively diode lamp 25 flashes close to the chosen device 3 with the chosen key. In case the desired key already has been removed by another user (empty key position), the user is able to be informed in the display  
15 window about who has removed the key. The key positions can be made visible on a PC, which belongs to or is connected to unit 2 and 4 respectively. The user can open a window in order to see the key positions visually. By moving the mouse to an empty key position and clicking the mouse, the user is able to obtain information about who has removed the key and the point of time this occurred.

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The present invention is not limited to the embodiments described above and shown in the drawings respectively, which only are to be regarded as exemplifying embodiments, which can be modified and supplemented in an arbitrary way within the scope of the inventive idea and the accompanying claims. The handling can relate to other items than keys, e.g. tools, documents, medical drugs etc.  
25 The characterizing features of the various embodiments or parts thereof can of course be mutually exchanged. The identification and control devices can of course be sealed or be protected in other ways against trespassing. The keys, i.e. the key rings and the like, can also be included in such a protection. In very special cases the pins can be designed as a part of a key.

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**CLAIMS**

1. A method of identification and control of handling of keys and the like, for each key or the like  
an identification and control device (3) being selected, which is registered , when the key is  
5 removed and returned respectively, **c h a r a c t e r i z e d i n t h a t** the identification code of the  
user is fed into a control center (4) , in that the fed code is forwarded to a printed circuit card (18)  
in a local control and indication unit (2), in that the removability and the removal are registered in  
said control unit (4) and indicated on said control and indication unit (2), in that an identification  
and control device (3) is used having a pin-like , hollow shell (26), in which a printed circuit card  
10 (42) and a chip (43) are mounted , the latter being loaded with a unique code for each identification  
and control device (3), and which is inserted into a hole (23) in said local control unit (2), and in  
that from the printed circuit card (42) and the chip (43) of said device and via contact means (19)  
information is sent to the printed circuit card (18) of the local control and indication unit (2).
- 15 2. A method according to claim 1, **c h a r a c t e r i z e d i n t h a t** the control and indication unit (2)  
is mounted in a key cabinet or the like , locked by a code lock, into which a personal code is fed by  
the user in order to be able to open the cabinet, in addition to a release of the door to the key cabinet  
or the like a signal to the printed circuit card (18) of the unit (2) being forwarded, for each insertion  
position (23) for an identification and control device (3) authorization and/or non-authorization  
20 being indicated, particularly by a diode lamp (25) showing a green light for authorization and a red  
light for non-authorization, in that , when one or several keys are removed with authorization, a  
signal is sent via the printed circuit card (18) of the unit (2) to said control center (4) having a  
central printed circuit card, in which the removal is registered and stored, and in that , when a  
removal without authorization is done, an alarm signal in a similar way is sent to said center and  
25 forwarded to e.g. an alarm device.
3. A method according to claim 1 or 2, **c h a r a c t e r i z e d i n t h a t** , up to the return of the  
key/the keys or the like, it/they and/or the attached identification and control device (3), when e.g. a  
door is unlocked, will send a signal, which is registered in said center and/or another center.  
30
4. A method according to any of claims 1-3, **c h a r a c t e r i z e d i n t h a t**, when the key/the keys  
or the like is (are) returned , associated diodes will emit light, when the user has given his code, in  
order to indicate, where the key/the keys is (are) to be inserted, which also will be registered in said  
center.  
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5 5. A method according to any of claims 1-4, **characterized in that**, via any of said centers, possibly via a connected PC, in each phase it is possible to control, who has removed which keys, and possibly also to determine the point of time for a removal, an unlocking, a locking, a return etc., preferably also security functions being integrated. e.g. a return of keys before a certain specified point of time.

10 6. An apparatus (1) for carrying out the method for identification and control of handling of keys or the like according to claim 1, for each key an identification and control device (3) being selected, which will be registered, when a removal and a return respectively takes place, **characterized in that** the identification code of the user will be fed into a control center (4), in that the fed code will be forwarded to a printed circuit card (18) in a local control and indication unit (2), in that the removability and the removal will be registered in said control center (4) and indicated on said control and indication unit (2), in that said identification and control device (3) is provided with a pin-like, hollow shell (26), in which a printed circuit card (42) and a chip (43) are mounted, the  
15 latter being loaded with a unique code for each identification and control device (3), and which shell will be inserted into a hole (23) in said local control and indication unit (2), and in that said device (3) will be brought to a contact position against and to a cooperation with contact means (19), connected to the printed circuit card (18) of the local control and indication unit (2).

20 7. An apparatus according to claim 6, **characterized in that** said control and indication unit (2) preferably is designed as a strip for a plurality of identification and control devices (3), which have a fastener (29) at their end for one or several keys, in that said unit (2) comprises a frame work (5), U-shaped in cross-section and preferably made of metal sheet, in which the longitudinal edges of the legs (11,13) end in narrow flanges (6), extending in opposite directions in  
25 relation to each other and having a few additional projecting eyes (7), designed to receive screws or the like for the fastening of the unit to a wall, in that in the U-profile a fastening profile (8) is inserted having the same length, in that the substantially L-shaped fastening profile has a base leg (9), which lies in the same plane as the flanges (6), to the free longitudinal edge of this leg a bearing leg (10), which is shorter in profile, being connected, designed to abut the inner side of one of the  
30 legs (11) of the frame work, in that the second leg (12) of the fastening profile (8) runs plane parallel to the second leg (13) of the frame work at a distance inside it, and in that bolts (15) extend through the front (14) of the frame work (5) and the base leg (9) and are provided with spacing sleeves (16), which fasten these two parts to each other to a manageable unit.

35 8. An apparatus according to claim 7, **characterized in that** the leg (12) of the fastening profile (8) via fastening means (17) supports a printed circuit card (18), on its side, which faces the

leg (11) of the frame work, contact means (19) extending from the printed circuit card towards said leg of the frame work and comprising a ribbon, plane parallelly disposed in relation to the front (14) of the frame work, said ribbon comprising electric cables, separated from each other, one for each identification and control device (3), and in that the base leg (9) of the fastening profile supports with its side, which faces the front of the frame work, via fastening means (20) a fastener (21) for permanent magnets (22), which project towards the front of the frame work, one for each identification and control device.

9. An apparatus according to claim 8, **characterized in that** the front of the frame work has a plurality of holes (23), which correspond to said number of identification and control devices (3), suitably having inwardly bent collars (24), designed to have a guiding effect, in that the front of the frame work is provided with diode lamps (25), connected to said printed circuit card (18) and associated with said holes and designed to indicate e.g. authorization and non-authorization, when an identification and control device (3) has been fully inserted, and in that non-authorization or non-availability will be indicated by a red light, whereas authorization or availability will be indicated by a green light.

10. An apparatus according to any of claims 6-9, **characterized in that** the pin-like shell (26) of said identification and control devices (3) is made of a light metal, the outer end (27) of the shell (26) preferably being pointed like a wedge and provided with a through hole (28) across it, designed to receive a key ring (29), to which one or several keys can be fastened, in that the shell (26) comprises two parts, a front inner part (30) and a rear outer part (31), in that the end sides (32,33) of the two parts, designed in this way, which end sides face each other, each are provided with a cylindrical recess (34 and 35 respectively), designed to receive a carrier (63) made of an electrically isolating material, e.g. a plastic material, in that the carrier has a substantially cylindrical shape and fits with press fit with the respective ends into a respective recess, cavities (37 and 38 respectively) being left behind, designed to receive e.g. screw-shaped electrically conductive compression springs (39,40), in that around the center of the shell a flange (41) extends, which separates the ends of said parts (30,31) from each other and consequently is an electrically isolating flange, in that a compression spring abuts each end of said printed circuit card (42) with one of its ends, the other end of the compression springs abutting the respective bottom of said recesses (34,35), and in that the end of each device (3), which is the front end in the insertion direction, receives in a recess (44) a steel washer (45), designed to cooperate with one of said permanent magnets via said ribbon (19) and an electric cable in it.

**LIST OF TERMS IN THE DESCRIPTION**

1. apparatus according to the invention
2. control and indication unit
- 5 3. identification and control device
4. control center
5. strip frame work
6. flanges
7. eye fastening means
- 10 8. fastening profile
9. base leg
10. bearing leg
11. first leg of the frame work
12. second leg of the fastening profile
- 15 13. second leg of the frame work
14. front of frame work
15. bolts
16. spacing sleeves
17. fastening means
- 20 18. printed circuit card in the strip
19. contact means
20. fastening means
21. fastener
22. permanent magnets
- 25 23. hole
24. collars
25. diode lamps
26. shell device
27. first end of device
- 30 28. hole
29. key-ring
30. front part of shell
31. rear part of shell
32. end side
- 35 33. end side
34. cylindrical recess

- 35. cylindrical recess
- 36. carrier
- 37. cavity
- 38. cavity
- 5 39. compression spring
- 40. compression spring
- 41. flange
- 42. printed circuit card
- 43. chip
- 10 44. recess
- 45. steel washer
- 46. signalling circuit

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FIG 1

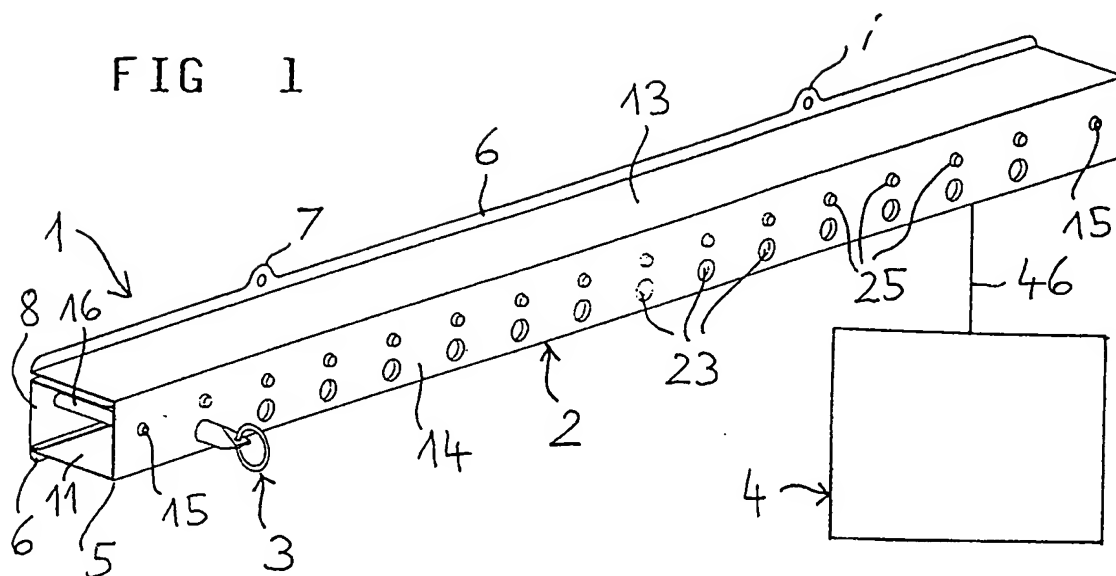


FIG 2

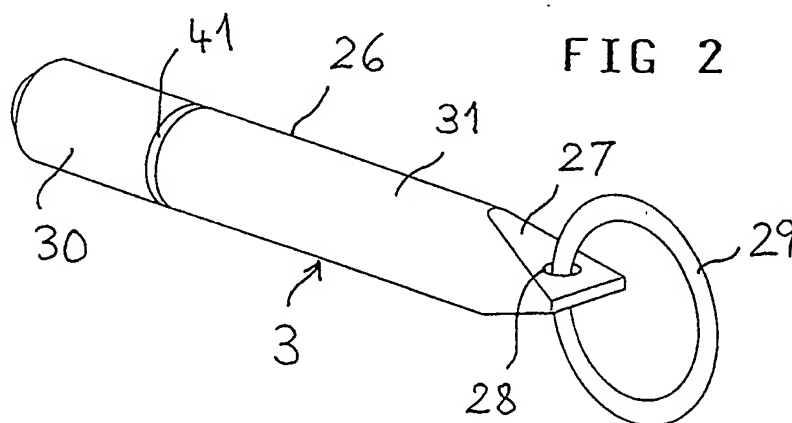
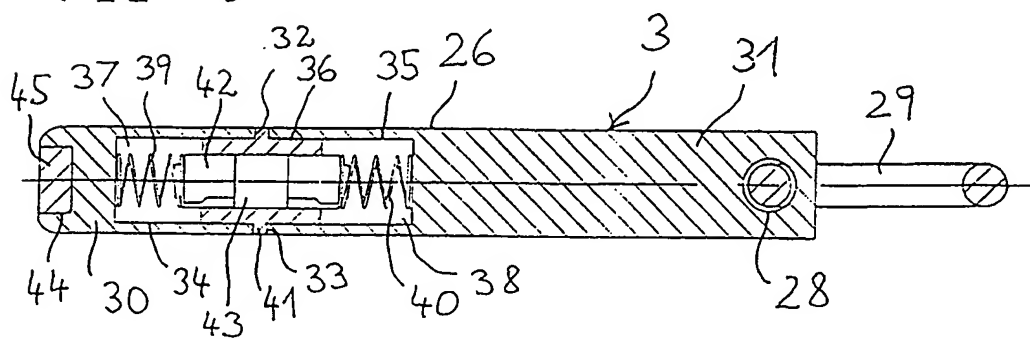
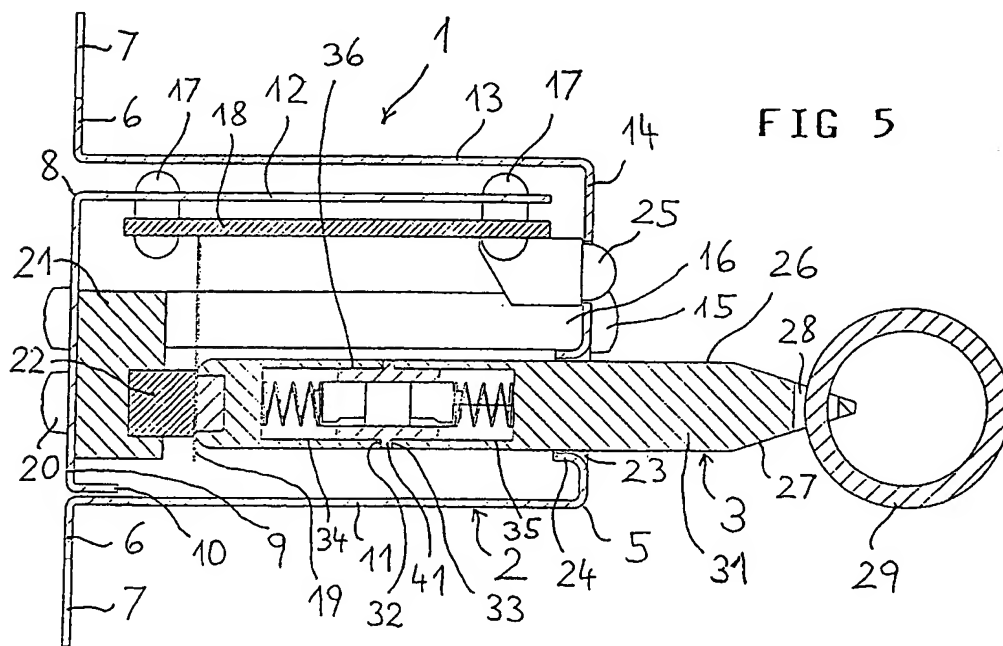
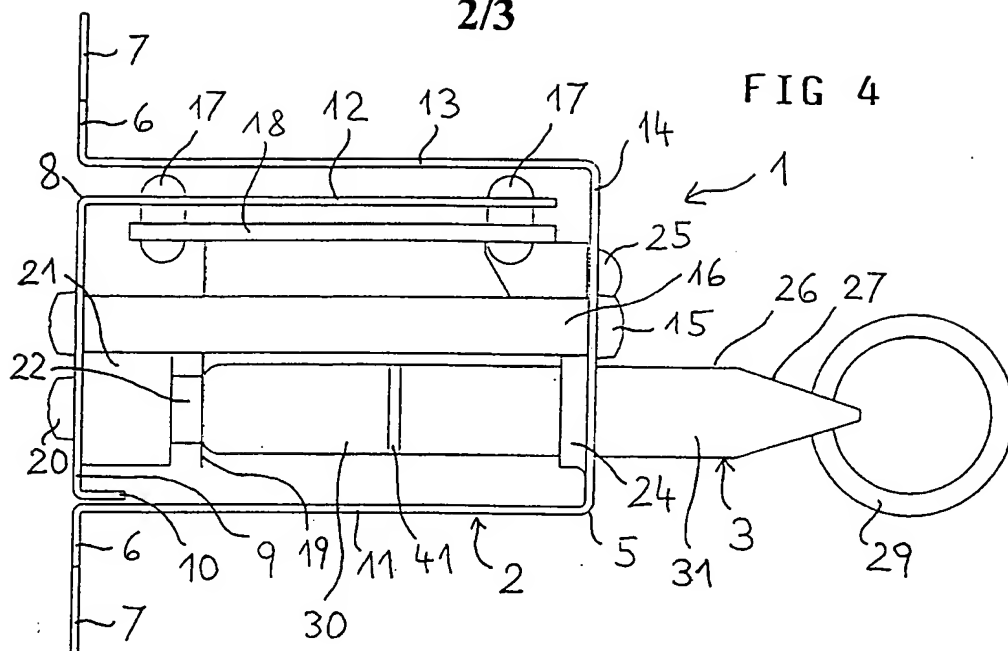


FIG 3

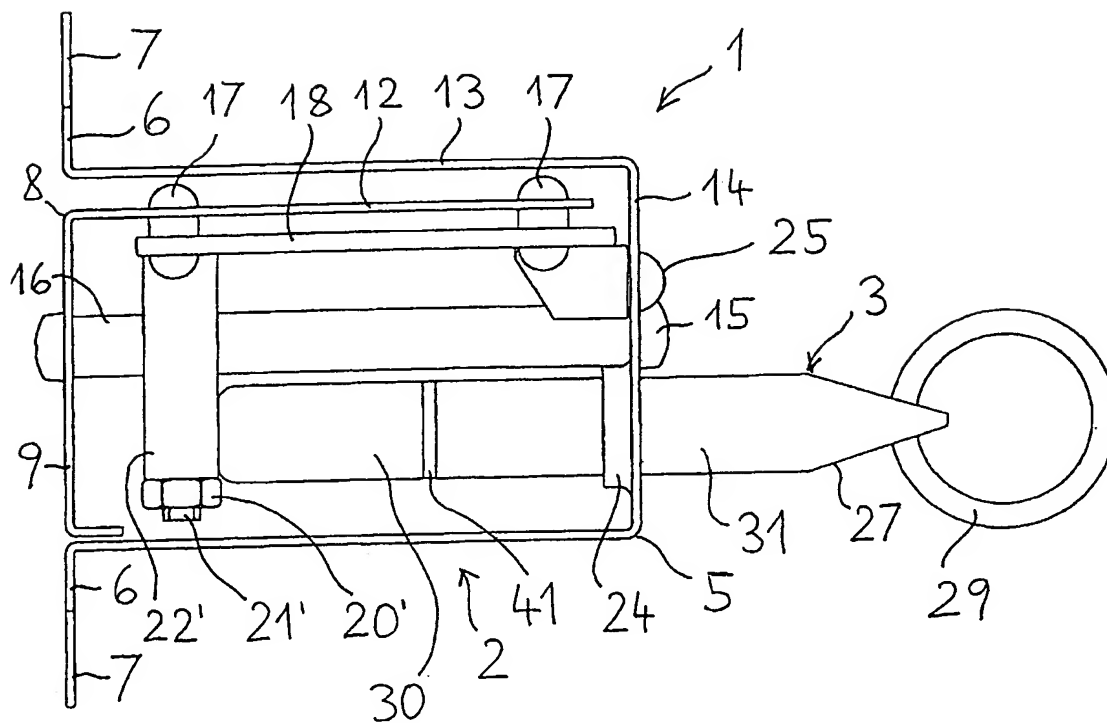


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Fig. 6



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 00/01764

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: G05B 19/00, G06K 17/00, G07C 11/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: E05B, G06K, G07C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	EP 0833283 A2 (REUTER, T. ET AL), 1 April 1998 (01.04.98) --	

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

\* Special categories of cited documents:

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 00/01764

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

02/11/00

International application No.

PCT/SE 00/01764

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